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ABSTRACT

Examined was the importance of the ability to read mathematical prose to the learning of mathematics by fifth graders. Early in the fall, a battery of instruments was administered; these included a computation test of division, four simple geometric questions, some non-routine problems, and an arithmetic reasoning test. A week later a reading test which utilized the Cloze procedure was administered. Near the middle of the school year a battery parallel to the pretest was given. Tests were scored and submitted to regression analysis. Results indicated that the best predictor of computation ability at midyear was computation at the beginning of the year; a similar relationship was observed for problem-solving ability. The ability to read mathematical prose contributed substantially to problem-solving ability and less so (but significantly) to computation. Copies of the tests and statistical tables are appended. (SD)

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May 1973

SMESG Working Paper No. 1

Mathematics Reading Ability

E. G. Begle

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With the cooperation of the Cupertino Union School District, a study was carried out by the Stanford Mathematics Education Study Group of the importance to mathematics learning of the ability to read mathematical prose. The study was carried out with fifth grade students. (A similar study employing eighth grade students was also attempted. However, due to misjudgement on the part of the principal investigator, the final test administered to the eighth graders turned out to be invalid and no interpretable statistics could be derived.)

A test of reading ability which utilized the cloze technique* had been developed during the 1971-72 school year by the SMSG Research and Analysis section. An account of the development of this test is found in SMSG Research and Analysis Working Paper No. 11 by Roger Jarvis.

Early in the fall of 1972 a battery of mathematics tests was administered, by the classroom teachers, to all the fifth grade students in 15 elementary schools in the Cupertino Union School District. A copy of this battery, Mathematics Inventory, Form A5, is attached to this working paper. The four tests contained in this battery were selected on the basis of SMSG experience as being probable predictors of student learning of mathematics during the first half of the school year. These predictors included a rote computation test of division, four simple geometric questions, a selection of non-routine problems, and finally a test, entitled "Arithmetic Reasoning taken from French's Kit of Reference Tests for Cognitive Factors. This test has been shown in many studies to be a good measure of abstract reasoning ability.

About a week after the administration of this battery the Reading Test, Form EA, was administered to the same classes. A copy of this test is attached to this working paper.

Towards the end of the first half of the school year a second battery of tests, Second Mathematics Inventory, Form B5, was administered to the same fifth grade classes. This battery contained two tests, one of rote computation in division and the second of problem solving. A copy of this inventory is attached to this working paper.

*For a discussion of this technique see: "The Cloze Procedrue - A Survey of Research" by Earl F. Rankin, Jr. Fourteenth Yearbook of the National Reading Conference, 1965, pp. 133-150.

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The tests administered in the fall were all known to be statistically sound. The tests administered in the spring, while they consisted of SMSG items, had not been investigated as tests. Accordingly, item analyses of both these tests were carried out. The summary statistics are shown in Table 1. It will be noted that for each of these tests the reliability, as measured by Cronbach's alpha, is satisfactorily high for a study such as this.

Before subjecting the resulting data to analysis all cases were doppped for which there were not scores on the four pretests, the reading test, and the two posttests (the latter are referred to in the analysis tables as "Post Division" and "Post Math"). For each of the latter two scores, stepwise regression was used to ascertain which of the initial measures correlated best with the criterion measure, which of the remaining initial measueres correlated best with the criterion measure after the first initial measure had been partialed out, etc.

These analyses were carried out for each of the fifteen schools separately. Tables 2 through 16 provide, for each school, the total number of students involved in the analysis, the means and standard deviations of all test scores for that school, the correlations between all these scores, and, finally, for each of the two criterion measures, the summary table for the stepwise regression.

Whenever none of the correlations of a criterion variable with any of the initial scores is statistically significant at the .01 level, the computer program prints out the message "Summary table omitted due to lack of information". It should be remembered that the significance of a correlation coefficient depends not only on the numerical size of the coefficient but also on the number of cases that it is based on. It will be noted that this lack of significance occurred, in most cases, in those schools where the number of students present at all three testing sessions was below the average.

Inspection of these tables reveals a reasonable amount of consistence from school to school and no major discrepancies. In all significant cases the scale "Working with Numbers" correlates highly with the criterion measures. For the rote computation criterion measure, the scale "Division" is another of the more highly correlated measures. In the case of the problem solving criterion measure the scale "Reading" follows closely "Working with Numbers".

Since no major discrepancies between schools were revealed, the students from all schools were pooled and the analyses were redone, using the total population of fifth graders who had been present at all three testing sessions. The result of this analysis as shown in Talbe 17 for the computational criterion measure and Table 18 for the problem solving criterion measure.

Three comments on these final statistical analyses are in order. Note first that the best predictor of computational skill in the middle of the school year was computational skill at the beginning of the school year. On the other hand, the best predictor of problem solving ability in the middle of the school year was problem solving ability at the beginning of the school year. This is quite in accord with numerous analyses of NLSMA data.

Next it should be noted that ability to read mathematical prose contributes substantially to the prediction of problem solving ability and, to a significant but much smaller extent, to computational ability. This observation answers the question which led to the study in the first place. These findings suggest that tests of mathematics reading ability, such as the one used in this study, might have diagnostic value in the case of mathematics underachievers in the upper elementary grades.

Finally, it must not be forgotten that the results obtained in this study are merely correlational. It cannot be assumed on the basis of these findings that if a special program should increase students' mathematics reading ability then their problem solving ability would increase correspondingly. An experiment along these lines would be of very great interest.

TABLE 1

SCALE STATISTICS: COMPUTATION SCALE

NUMBER OF CASES	=	65
NUMBER OF ITEMS	=	6
MEAN TOTAL SCORE	=	2.692
STANDARD DEVIATION	=	2.141
CRONBACH'S ALPHA	=	0.837
ERROR OF MEASUREMENT	=	0.864

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
1	0.477	0.508	0.757	6.154
2	0.705	0.730	0.688	3.077
3	0.308	0.357	0.742	13.846
4	0.400	0.491	0.834	18.462
5	0.354	0.426	0.999	16.923
6	0.446	0.569	0.701	21.538

SCALE STATISTICS: PROBLEM SCALE

NUMBER OF CASES	=	70
NUMBER OF ITEMS	=	24
MEAN TOTAL SCORE	=	10.186
STANDARD DEVIATION	=	3.670
CRONBACH'S ALPHA	=	0.637
ERROR OF MEASUREMENT	=	2.210

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
7	0.286	0.323	0.370	11.429
8	0.543	0.594	0.610	8.571
9	0.729	0.750	0.350	2.857
10	0.629	0.629	0.389	0.0
11	0.629	0.647	0.131	2.857
12	0.586	0.651	0.527	10.000
13	0.143	0.143	-0.246	0.0
14	0.043	0.043	-0.061	1.429
15	0.343	0.358	0.317	4.286
16	0.457	0.471	0.117	2.857
17	0.343	0.358	0.375	4.286
18	0.386	0.409	0.204	5.714
19	0.471	0.493	0.104	4.286
20	0.257	0.273	-0.270	5.714
21	0.500	0.530	0.380	5.714
22	0.543	0.567	0.487	4.286
23	0.429	0.476	0.624	10.000
24	0.557	0.591	0.303	5.714
25	0.271	0.279	0.426	2.857
26	0.257	0.231	0.278	8.571
27	0.571	0.606	0.272	5.714
28	0.371	0.400	0.354	7.143
29	0.429	0.469	0.260	8.571
30	0.414	0.460	0.363	10.000

-- SCHOOL = 1.000 TOTAL CASES ACCEPTED = 55

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	3.1455	2.1809	7	1.00	0.62	0.64	-0.20	0.43	0.34	0.33
POSTMATH	8	9.8364	5.1343	8		1.00	0.73	0.03	0.59	0.36	0.57
DIVISION	2	5.1636	2.7740	2			1.00	0.01	0.64	0.35	0.49
GEOMETRY	3	2.4727	0.7901	3				1.00	0.13	-0.06	0.06
WORK NUM	4	4.2909	2.2581	4					1.00	0.52	0.43
ARITH REAS	5	3.9636	1.9811	5						1.00	0.38
READING	6	45.6727	9.9945	6							1.00

TABLE 2

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.4763	0.2269	0.2269	15.5550	0.0002
DIVISION		2	2	0.6503	0.4228	0.1959	17.6523	0.0001
GEOMETRY		3	3	0.6888	0.4744	0.0516	5.0030	0.0297
ARITH REAS		5	4	0.6914	0.4780	0.0036	0.3447	0.5598
READING		6	5	0.6915	0.4781	0.0001	0.0116	0.9147

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5920	0.3504	0.3504	28.5930	0.0000
DIVISION		2	2	0.7490	0.5609	0.2105	24.9308	0.0000
READING		6	3	0.7804	0.6091	0.0481	6.2781	0.0155
GEOMETRY		3	4	0.7805	0.6093	0.0002	0.0245	0.8762
ARITH REAS		5	5	0.7806	0.6093	0.0000	0.0012	0.9726

-- SCHOOL = 2.000 TOTAL CASES ACCEPTED = 70

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION
POSTDIV	7	1.6571	1.9253
POSTMATH	8	9.7571	4.2544
DIVISION	2	3.4429	2.0546
GEOMETRY	3	2.4000	0.8912
WORK NUM	4	4.4000	2.2159
ARITH REAS	5	3.2000	1.8697
READING	6	45.2428	11.4631

****CORRELATION MATRIX****

	7	8	2	3	4	5	6
7	1.00	0.54	0.43	0.22	0.39	0.45	0.38
8		1.00	0.41	0.36	0.56	0.60	0.53
2			1.00	0.29	0.39	0.36	0.23
3				1.00	0.34	0.28	0.12
4					1.00	0.41	0.41
5						1.00	0.51
6							1.00

TABLE 3

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.3859	0.1489	0.1489	11.8988	0.0010
ARITH REAS		5	2	0.4973	0.2478	0.0989	8.3106	0.0041
DIVISION		2	3	0.5518	0.3045	0.0567	5.3806	0.0235
READING		6	4	0.5665	0.3209	0.0164	1.5677	0.2146
GEOMETRY		3	5	0.5667	0.3212	0.0003	0.0247	0.8756

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5639	0.3180	0.3180	31.7035	0.0000
ARITH REAS		5	2	0.6918	0.4786	0.1606	20.6413	0.0000
READING		6	3	0.7137	0.5094	0.0308	4.1471	0.0457
GEOMETRY		3	4	0.7265	0.5278	0.0183	2.5239	0.1168
DIVISION		2	5	0.7337	0.5380	0.0103	1.4210	0.2371

-- SCHOOL = 3.000 TOTAL CASES ACCEPTED = 44

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	3.5000	1.5019	7	1.00	0.07	0.16	-0.16	0.14	0.22	0.10
POSTMATH	8	9.7727	4.3018	8		1.00	0.16	-0.07	0.41	0.22	0.60
DIVISION	2	3.2500	1.8568	2			1.00	-0.04	0.23	-0.04	0.11
GEOMETRY	3	2.4091	0.7871	3				1.00	0.00	0.16	-0.01
WORK NUM	4	3.3182	1.8398	4					1.00	0.01	0.46
ARITH REAS	5	3.3182	1.5518	5						1.00	0.01
READING	6	39.8864	13.9867	6							1.00

DEPENDENT VARIABLE 7 POSTDIV SUMMARY TABLE OMITTED DUE TO LACK OF INFORMATION

TABLE 4

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.4090	0.1673	0.1673	8.4362	0.0058
READING		6	2	0.6186	0.3827	0.2155	14.3105	0.0005
ARITH REAS		5	3	0.6527	0.4260	0.0433	3.0162	0.0901
GEOMETRY		3	4	0.6611	0.4371	0.0111	0.7697	0.3857
DIVISION		2	5	0.6656	0.4430	0.0058	0.3988	0.5315

-- SCHOOL = 4.000 TOTAL CASES ACCEPTED = 42

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION
POSTDIV	7	2.9286	2.2130
POSTMATH	8	9.2381	4.0292
DIVISION	2	3.9524	2.4190
GEOMETRY	3	2.3810	1.0110
WORK NUM	4	3.5952	1.7539
ARITH REAS	5	3.3095	1.4226
READING	6	43.1190	9.6732

****CORRELATION MATRIX****

	7	8	2	3	4	5	6
7	1.00	0.38	0.56	0.11	0.34	0.18	0.18
8		1.00	0.55	0.30	0.48	0.19	0.38
2			1.00	0.09	0.27	0.31	0.24
3				1.00	0.23	0.12	0.14
4					1.00	0.10	0.18
5						1.00	0.24
6							1.00

DEPENDENT VARIABLE 7 POSTDIV SUMMARY TABLE OMITTED DUE TO LACK OF INFORMATION

TABLE 5

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.4834	0.2336	0.2336	12.1948	0.0012
DIVISION		2	2	0.6499	0.4223	0.1887	12.7393	0.0010
READING		6	3	0.6849	0.4691	0.0468	3.3490	0.0751
GEOMETRY		3	4	0.7040	0.4956	0.0264	1.9394	0.1719
ARITH REAS		5	5	0.7052	0.4973	0.0017	0.1213	0.7297

-- SCHOOL = 5.000 TOTAL CASES ACCEPTED = 46

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	3.4130	2.2368	7	1.00	0.42	0.49	-0.12	0.34	0.39	0.47
POSTMATH	8	9.4565	3.9649	8		1.00	0.34	0.20	0.51	0.41	0.30
DIVISION	2	3.8478	2.3941	2			1.00	0.27	0.40	0.30	0.25
GEOMETRY	3	2.5217	1.2497	3				1.00	0.41	0.36	0.27
WORK NUM	4	3.5652	2.0618	4					1.00	0.45	0.48
ARITH REAS	5	2.7609	1.6355	5						1.00	0.46
READING	6	38.7391	12.2754	6							1.00

TABLE 6

DEPENDENT VARIABLE 7 POSTDIV SUMMARY TABLE OMITTED DUE TO LACK OF INFORMATION

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5114	0.2615	0.2615	15.5827	0.0003
ARITH REAS		5	2	0.5502	0.3026	0.0412	2.5437	0.1180
DIVISION		2	3	0.5635	0.3175	0.0148	0.9081	0.3461
GEOMETRY		3	4	0.5670	0.3214	0.0039	0.2364	0.6294
READING		6	5	0.5670	0.3214	0.0000	0.0000	0.9956

-- SCHOOL = 6.000 TOTAL CASES ACCEPTED = 48

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	2.1667	2.0035	7	1.00	0.38	0.50	0.19	0.16	0.32	0.26
POSTMATH	8	10.5417	3.9731	8		1.00	0.27	0.52	0.53	0.34	0.51
DIVISION	2	2.6042	1.9972	2			1.00	0.07	0.31	0.21	0.19
GEOMETRY	3	2.8333	0.8588	3				1.00	0.44	0.24	0.40
WORK NUM	4	4.2917	1.8675	4					1.00	0.14	0.47
ARITH REAS	5	3.2500	1.6322	5						1.00	0.39
READING	6	42.9792	8.8161	6							1.00

DEPENDENT VARIABLE 7 POSTDIV SUMMARY TABLE OMITTED DUE TO LACK OF INFORMATION

TABLE 7

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5260	0.2766	0.2766	17.5913	0.0001
GEOMETRY		3	2	0.6157	0.3791	0.1024	7.4226	0.0091
READING		6	3	0.6573	0.4320	0.0530	4.1027	0.0489
ARITH REAS		5	4	0.6718	0.4513	0.0193	1.5138	0.2249
DIVISION		2	5	0.6787	0.4607	0.0093	0.7272	0.3986

-- SCHOOL = 7.000 TOTAL CASES ACCEPTED = 55

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION
POSTDIV	7	3.7818	1.9215
POSTMATH	8	11.4364	3.8092
DIVISION	2	3.7818	1.9311
GEOMETRY	3	2.3455	0.8653
WORK NUM	4	4.3273	2.3417
ARITH REAS	5	3.3818	1.4592
READING	6	44.0909	8.6180

****CORRELATION MATRIX****

	7	8	2	3	4	5	6
7	1.00	0.38	-0.44	0.27	0.51	0.42	0.42
8		1.00	0.32	0.26	0.62	0.28	0.55
2			1.00	0.16	0.36	0.54	0.36
3				1.00	0.35	0.29	0.21
4					1.00	0.45	0.45
5						1.00	0.24
6							1.00

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5100	0.2601	0.2601	18.6346	0.0001
DIVISION		2	2	0.5790	0.3353	0.0752	5.8801	0.0188
READING		6	3	0.5993	0.3591	0.0239	1.8981	0.1741
ARITH REAS		5	4	0.6099	0.3720	0.0128	1.0230	0.3160
GEOMETRY		3	5	0.6128	0.3755	0.0035	0.2742	0.6029

TABLE 8

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.6169	0.3806	0.3806	32.5623	0.0000
READING		6	2	0.6870	0.4720	0.0915	9.0071	0.0041
DIVISION		2	3	0.6878	0.4731	0.0011	0.1073	0.7446
GEOMETRY		3	4	0.6884	0.4739	0.0007	0.0711	0.7908
ARITH REAS		5	5	0.6890	0.4747	0.0008	0.0756	0.7846

-- SCHOOL = 8.000 TOTAL CASES ACCEPTED = 60

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION
POSTDIV	7	2.0667	2.1062
POSTMATH	8	11.2500	4.1645
DIVISION	2	3.1333	2.1270
GEOMETRY	3	2.6167	1.0750
WORK NUM	4	4.0167	2.4040
ARITH REAS	5	3.1500	1.9029
READING	6	38.4000	12.1811

****CORRELATION MATRIX****

	7	8	2	3	4	5	6
7	1.00	0.63	0.61	0.37	0.70	0.39	0.55
8		1.00	0.43	0.39	0.68	0.47	0.63
2			1.00	0.48	0.57	0.24	0.46
3				1.00	0.40	0.17	0.34
4					1.00	0.50	0.68
5						1.00	0.57
6							1.00

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.6994	0.4891	0.4891	55.5321	0.0000
DIVISION		2	2	0.7456	0.5560	0.0668	8.5780	0.0049
READING		6	3	0.7487	0.5605	0.0046	0.5817	0.4489
ARITH REAS		5	4	0.7495	0.5618	0.0012	0.1548	0.6956
GEOMETRY		3	5	0.7496	0.5619	0.0001	0.0166	0.8979

TABLE 9

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.6801	0.4626	0.4626	49.9245	0.0000
READING		6	2	0.7184	0.5160	0.0535	6.2952	0.0150
GEOMETRY		3	3	0.7255	0.5263	0.0103	1.2147	0.2745
ARITH REAS		5	4	0.7301	0.5331	0.0068	0.8005	0.3749
DIVISION		2	5	0.7301	0.5331	0.0000	0.0001	0.9912

-- SCHOOL = 9.000 TOTAL CASES ACCEPTED = 49

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	3.9796	2.1163	7	1.00	0.51	0.46	0.13	0.47	0.34	0.42
POSTMATH	8	11.6939	4.2876	8		1.00	0.41	0.24	0.59	0.25	0.58
DIVISION	2	4.5102	2.0527	2			1.00	0.03	0.34	0.28	0.23
GEOMETRY	3	2.5102	0.8446	3				1.00	-0.02	0.04	0.27
WORK NUM	4	5.0000	2.4749	4					1.00	0.38	0.44
ARITH REAS	5	4.2653	1.5649	5						1.00	0.25
READING	6	46.0204	10.6075	6							1.00

TABLE 10

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.4694	0.2203	0.2203	13.2798	0.0007
DIVISION		2	2	0.5656	0.3200	0.0997	6.7410	0.0126
READING		6	3	0.6028	0.3634	0.0434	3.0675	0.0866
ARITH REAS		5	4	0.6119	0.3744	0.0110	0.7768	0.3829
GEOMETRY		3	5	0.6159	0.3793	0.0049	0.3422	0.5616

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5949	0.3539	0.3539	25.7432	0.0000
READING		6	2	0.6906	0.4769	0.1230	10.8167	0.0019
DIVISION		2	3	0.7150	0.5112	0.0343	3.1591	0.0822
GEOMETRY		3	4	0.7305	0.5336	0.0224	2.1142	0.1529
ARITH REAS		5	5	0.7318	0.5355	0.0018	0.1709	0.6813

-- SCHOOL = 10.000 TOTAL CASES ACCEPTED = 6[illegible]

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	2.2222	2.3992	7	1.00	0.77	0.74	0.38	0.75	0.52	0.69
POSTMATH	8	9.8254	5.8600	8		1.00	0.68	0.38	0.80	0.66	0.79
DIVISION	2	2.8889	2.5216	2			1.00	0.28	0.72	0.55	0.68
GEOMETRY	3	2.5079	1.0757	3				1.00	0.34	0.31	0.29
WORK NUM	4	4.2698	3.1633	4					1.00	0.58	0.75
ARITH REAS	5	2.8571	1.7676	5						1.00	0.66
READING	6	41.2063	17.2141	6							1.00

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.7549	0.5699	0.5699	80.8223	0.0000
DIVISION		2	2	0.8054	0.6487	0.0789	13.4711	0.0005
GEOMETRY		3	3	0.8141	0.6628	0.0141	2.4594	0.1220
READING		6	4	0.8192	0.6712	0.0084	1.4739	0.2292
ARITH REAS		5	5	0.8194	0.6715	0.0003	0.0563	0.8133

TABLE 11

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.7978	0.6366	0.6366	106.8388	0.0000
READING		6	2	0.8498	0.7221	0.0856	18.4732	0.0001
ARITH REAS		5	3	0.8603	0.7401	0.0180	4.0753	0.0480
GEOMETRY		3	4	0.8639	0.7463	0.0062	1.4188	0.2380
DIVISION		2	5	0.8648	0.7479	0.0016	0.3577	0.5521

-- SCHOOL = 11.000 TOTAL CASES ACCEPTED = 54

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	3.1296	2.0192	7	1.00	0.47	0.43	0.19	0.52	0.21	0.52
POSTMATH	8	12.5370	4.1741	8		1.00	0.43	0.43	0.59	0.38	0.62
DIVISION	2	4.0185	2.3188	2			1.00	0.12	0.55	0.31	0.33
GEOMETRY	3	3.0000	0.7524	3				1.00	0.25	0.13	0.30
WORK NUM	4	5.3519	2.6504	4					1.00	0.41	0.56
ARITH REAS	5	3.3704	1.5576	5						1.00	0.13
READING	6	45.6481	11.1341	6							1.00

TABLE 12

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5166	0.2669	0.2669	18.9315	0.0001
READING		6	2	0.5886	0.3465	0.0796	6.2125	0.0160
DIVISION		2	3	0.6132	0.3761	0.0296	2.3693	0.1299
ARITH REAS		5	4	0.6134	0.3762	0.0002	0.0126	0.9112
GEOMETRY		3	5	0.6134	0.3763	0.0001	0.0051	0.9433

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5880	0.3458	0.3458	27.4854	0.0000
READING		6	2	0.6837	0.4674	0.1216	11.6439	0.0013
GEOMETRY		3	3	0.7218	0.5210	0.0536	5.5971	0.0219
ARITH REAS		5	4	0.7470	0.5580	0.0370	4.1013	0.0483
DIVISION		2	5	0.7540	0.5686	0.0105	1.1736	0.2835

-- SCHOOL = 12.000 TOTAL CASES ACCEPTED = 67

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION
POSTDIV	7	2.2687	2.1432
POSTMATH	8	9.7910	4.9682
DIVISION	2	3.6119	2.5758
GEOMETRY	3	3.1194	0.8620
WORK NUM	4	4.3731	2.3984
ARITH REAS	5	3.5224	1.6547
READING	6	42.0746	13.0932

****CORRELATION MATRIX****

	7	8	2	3	4	5	6
7	1.00	0.60	0.57	0.18	0.64	0.48	0.45
8		1.00	0.63	0.14	0.66	0.54	0.56
2			1.00	0.10	0.65	0.66	0.56
3				1.00	0.21	0.15	0.06
4					1.00	0.55	0.68
5						1.00	0.63
6							1.00

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	MULTIPLE RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.6405	0.4102	0.4102	45.2029	0.0000
DIVISION		2	2	0.6704	0.4494	0.0393	4.5647	0.0364
ARITH REAS		5	3	0.6732	0.4532	0.0038	0.4331	0.5129
GEOMETRY		3	4	0.6753	0.4560	0.0028	0.3147	0.5768
READING		6	5	0.6764	0.4575	0.0015	0.1722	0.6797

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	MULTIPLE RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.6602	0.4359	0.4359	50.2221	0.0000
DIVISION		2	2	0.7133	0.5088	0.0729	9.4978	0.0030
ARITH REAS		5	3	0.7198	0.5181	0.0093	1.2193	0.2730
READING		6	4	0.7223	0.5216	0.0036	0.4603	0.5000
GEOMETRY		3	5	0.7225	0.5220	0.0003	0.0403	0.8415

TABLE 13

-- SCHOOL = 13.000 TOTAL CASES ACCEPTED = 85

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	4.1412	2.0882	7	1.00	0.62	0.40	0.08	0.38	0.47	0.48
POSTMATH	8	12.0235	4.7559	8		1.00	0.53	0.22	0.72	0.58	0.68
DIVISION	2	4.2235	2.0200	2			1.00	0.31	0.54	0.36	0.51
GEOMETRY	3	2.9176	1.0489	3				1.00	0.24	0.32	0.39
WORK NUM	4	5.4471	2.6882	4					1.00	0.57	0.62
ARITH REAS	5	3.5882	2.0833	5						1.00	0.56
READING	6	44.0824	14.3611	6							1.00

TABLE 14

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.3788	0.1435	0.1435	13.9078	0.0003
READING		6	2	0.4905	0.2406	0.0971	10.4835	0.0017
ARITH REAS		5	3	0.5387	0.2902	0.0496	5.6549	0.0197
DIVISION		2	4	0.5624	0.3163	0.0261	3.0539	0.0843
GEOMETRY		3	5	0.5898	0.3479	0.0316	3.8295	0.0538

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.7171	0.5142	0.5142	87.8645	0.0000
READING		6	2	0.7764	0.6028	0.0886	18.2843	0.0001
ARITH REAS		5	3	0.7867	0.6189	0.0161	3.4149	0.0682
DIVISION		2	4	0.7915	0.6265	0.0077	1.6446	0.2029
GEOMETRY		3	5	0.7961	0.6337	0.0072	1.5523	0.2160

-- SCHOOL = 14.000 TOTAL CASES ACCEPTED = 40

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	2.7750	2.0442	7	1.00	0.71	0.49	0.33	0.24	0.54	0.57
POSTMATH	8	10.8500	4.2940	8		1.00	0.51	0.01	0.28	0.48	0.55
DIVISION	2	3.2750	1.8396	2			1.00	0.21	0.08	0.43	0.41
GEOMETRY	3	2.2500	0.8086	3				1.00	0.00	0.11	0.25
WORK NUM	4	4.2000	1.7716	4					1.00	0.04	0.42
ARITH REAS	5	3.4000	1.4286	5						1.00	0.42
READING	6	40.6500	12.6366	6							1.00

TABLE 15

DEPENDENT VARIABLE 7 POSTDIV SUMMARY TABLE OMITTED DUE TO LACK OF INFORMATION

DEPENDENT VARIABLE 8 POSTMATH SUMMARY TABLE OMITTED DUE TO LACK OF INFORMATION

-- SCHOOL = 15.000 TOTAL CASES ACCEPTED = 44

****CORRELATION MATRIX****

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION		7	8	2	3	4	5	6
POSTDIV	7	4.2727	2.0727	7	1.00	0.65	0.62	0.42	0.54	0.53	0.46
POSTMATH	8	12.3864	4.8379	8		1.00	0.53	0.34	0.62	0.48	0.55
DIVISION	2	4.3182	2.2075	2			1.00	0.65	0.58	0.60	0.34
GEOMETRY	3	2.7955	1.0248	3				1.00	0.40	0.65	0.38
WORK NUM	4	5.8409	2.5604	4					1.00	0.64	0.59
ARITH REAS	5	3.6818	2.1434	5						1.00	0.51
READING	6	48.9091	12.8530	6							1.00

TABLE 16

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.5430	0.2949	0.2949	17.5618	0.0001
DIVISION		2	2	0.6609	0.4368	0.1419	10.3330	0.0025
READING		6	3	0.6833	0.4669	0.0301	2.2558	0.1409
ARITH REAS		5	4	0.6862	0.4709	0.0041	0.3006	0.5867
GEOMETRY		3	5	0.6885	0.4740	0.0030	0.2191	0.6424

SUMMARY TABLE DEPENDENT VARIABLE 8 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		4	1	0.6153	0.3785	0.3785	25.5823	0.0000
READING		6	2	0.6570	0.4317	0.0532	3.8356	0.0570
DIVISION		2	3	0.6892	0.4750	0.0433	3.2959	0.0769
GEOMETRY		3	4	0.6932	0.4805	0.0055	0.4155	0.5229
ARITH REAS		5	5	0.6933	0.4806	0.0001	0.0098	0.9219

TOTAL CASES ACCEPTED = 822

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION
POSTDIV	6	3.0000	2.2243
DIVISION	1	3.7397	2.3019
GEOMETRY	2	2.6290	0.9645
WORK NUM	3	4.4696	2.4496
ARITH REAS	4	3.4002	1.7766
READING	5	43.1618	12.5119

****CORRELATION MATRIX****

	6	1	2	3	4	5
6	1.00	0.53	0.16	0.48	0.40	0.43
1		1.00	0.21	0.49	0.40	0.41
2			1.00	0.29	0.23	0.24
3				1.00	0.44	0.56
4					1.00	0.45
5						1.00

TABLE 17

SUMMARY TABLE DEPENDENT VARIABLE 6 POSTDIV

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
DIVISION		1	1	0.5321	0.2832	0.2832	323.9456	0.0000
WORK NUM		3	2	0.5872	0.3447	0.0616	76.9498	0.0000
READING		5	3	0.6034	0.3641	0.0194	24.9425	0.0000
ARITH REAS		4	4	0.6125	0.3751	0.0110	14.3913	0.0002
GEOMETRY		2	5	0.6130	0.3758	0.0006	0.8011	0.3710

TOTAL CASES ACCEPTED = 822

VARIABLE NAME	VARIABLE NUMBER	MEAN	STANDARD DEVIATION
POSTMATH	7	10.7214	4.6219
DIVISION	1	3.7397	2.3019
GEOMETRY	2	2.6290	0.9645
WORK NUM	3	4.4696	2.4496
ARITH REAS	4	3.4002	1.7766
READING	5	43.1618	12.5119

****CORRELATION MATRIX****

	7	1	2	3	4	5
7	1.00	0.48	0.26	0.63	0.45	0.58
1		1.00	0.21	0.49	0.40	0.41
2			1.00	0.29	0.23	0.24
3				1.00	0.44	0.56
4					1.00	0.45
5						1.00

TABLE 18

SUMMARY TABLE DEPENDENT VARIABLE 7 POSTMATH

VARIABLE NAME	VAR NO. REMOVED	VAR NO. ENTERED	STEP NO.	MULTIPLE R	RSQ	INCREASE IN RSQ	F VALUE TO ENTER/REMOVE	P
WORK NUM		3	1	0.6281	0.3945	0.3945	534.2046	0.0
READING		5	2	0.6863	0.4711	0.0766	118.5816	0.0000
DIVISION		1	3	0.7032	0.4945	0.0234	37.9434	0.0000
ARITH REAS		4	4	0.7094	0.5032	0.0087	14.3353	0.0002
GEOMETRY		2	5	0.7107	0.5051	0.0019	3.1671	0.0746

MATHEMATICS INVENTORY

FORM A5

This is an inventory of the understandings and skills you may have acquired since you entered school. It is not a test. The inventory will help us find out what mathematics is taught in classrooms throughout the county.

Be sure you understand the directions before you begin working. Do not spend too much time on any one problem. There will be some problems you have not yet learned how to do. This is to be expected because there are many different kinds of questions and problems in the inventory. First, try all of the problems you can. Then, if you have time, go back and try the questions which you did not answer.

Each question or problem is followed by some answer choices. Decide which one you think is correct. Use the blank spaces in this test booklet for scratchwork. Record all of your answers on the answer sheet by circling the letter of the answer you choose. Be sure to mark only <u>one answer for each question</u>. If you make a mistake or wish to change an answer, be sure to erase your first choice completely.

Note how the answer to the sample question has been marked on the sample answer sheet below:

SAMPLE QUESTION:

USE THIS SPACE FOR SCRATCHWORK

0. 2 + 2 is

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

The correct answer is 4, which is choice (D). Therefore, (D) has been circled.

0. (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

Part I

The questions in the first part of this inventory are division problems. You will have 5 minutes to do these problems.

1. $3\overline{)69}$

   (A) 13 (B) 20 (C) 23 (D) 32 (E) None of these

2. $3\overline{)609}$

   (A) 20 (B) 23 (C) 27 (D) 213 (E) None of these

3. $4\overline{)804}$

   (A) 21 (B) 201 (C) 204 (D) 210 (E) None of these

4. $7\overline{)91}$

   (A) 8 (B) 11 (C) 13 (D) 17 (E) None of these

5. $6\overline{)846}$

   (A) 101 (B) 141 (C) 142 (D) 144 (E) None of these

6. $6\overline{)882}$

   (A) 110 (B) 111 (C) 137 (D) 147 (E) None of these

7. $6\overline{)7356}$

   (A) 1001 (B) 1071 (C) 1211 (D) 1226 (E) None of these

8. $7\overline{)756}$

   (A) 18 (B) 100 (C) 108 (D) 111 (E) None of these

9. $3\overline{)613209}$

   (A) 2443 (B) 24403 (C) 201003 (D) 204403 (E) None of these

STOP. WAIT FOR NEXT INSTRUCTION.

Instructions

Part II

Geometry

In this part there are 4 questions about geometric figures.

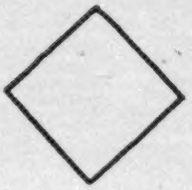
You will mark your answers on the same answer sheet beginning with number 10.

You are to work as many questions as you can. Do not spend too much time on any one question. You should only guess if you can rule out some of the choices. DO NOT guess wildly.

You will have 2 minutes for this section.

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

10. This figure is a



(A) circle

(B) hexagon

(C) trapezoid

(D) square

(E) triangle

11. This figure is a

(A) circle

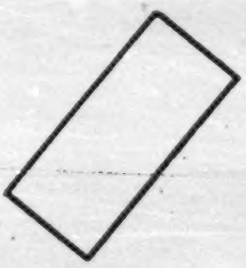
(B) polygon

(C) rectangle

(D) square

(E) triangle

12. This figure is a



(A) circle

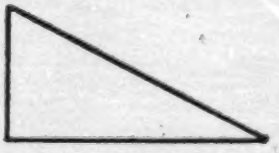
(B) pentagon

(C) rectangle

(D) square

(E) triangle

13. This figure is a



(A) circle

(B) rectangle

(C) square

(D) triangle

(E) parallelogram

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

Instructions

Part III

Working with Numbers

In this part there are 12 questions about working with numbers.

Here is an example of how you should mark your paper.

Example 0.

Subtract 807 from 1,725

(A) 819
(B) 918
(C) 928
(D) 1,018
(E) 1,622

The answer is 918, so (B) should be circled.

You will mark all of your answers on the same answer sheet, beginning with number 14. You may use any space in the booklet for scratchwork.

You are to work as many questions as you can. Do not spend too much time on any one question. You should only guess if you can rule out some of the choices. DO NOT guess wildly.

You will have 20 minutes for this section.

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

The first two questions are about a ringtoss game.

In ringtoss, each player gets three rings to toss. Rings on the peg win 25 points each. Rings off the peg lose 10 points each.

14. David has two on and one off. How many points does he get?

(A) 5
(B) 15
(C) 35
(D) 40
(E) 60

15. Bill has one on and two off. How many points does he get?

(A) 5
(B) 20
(C) 25
(D) 40
(E) 45

16. What number does ◇ stand for if $3 \times 4 \times 5 = 12 \times \diamond$ is a true statement?

(A) 20
(B) 0
(C) 3
(D) 4
(E) 5

12 X 5 = 60

17. Which formula would you use to find how many stamps each person should get if 31 people share equally a package of 2325 stamps?

(A) $31 \div 2325 = n$
(B) $2325 \div 31 = n$
(C) $2325 - 31 = n$
(D) $31 \times 2325 = n$
(E) $n - 2325 = 31$

GO ON TO NEXT PAGE

18. Suppose we decided to write fractions in a different way. For example, instead of $\frac{2}{3}$ we would write $(2,3)$ and instead of $\frac{7}{5}$ we would write $(7,5)$. What would be the sum of $(1,5)$ and $(3,5)$?

(A) $(3,5)$
(B) $(4,5)$
(C) $(3,10)$
(D) $(4,10)$
(E) $(3,25)$

19. Suppose each of the following is true:

$1 \triangleleft 1 = 0$ $\quad$ $7 \triangleleft 2 = 13$
$2 \triangleleft 2 = 3$ $\quad$ $4 \triangleleft 4 = 15$
$5 \triangleleft 6 = 29$ $\quad$ $9 \triangleleft 2 = 17$

What does $6 \triangleleft 3$ equal?

(A) 6
(B) 3
(C) 9
(D) 17
(E) 18

20. Which of the following will always produce an odd number?

I. The sum of any two odd numbers.
II. The sum of any three even numbers.
III. The sum of any three odd numbers.

(A) I only
(B) II only
(C) III only
(D) I and II only
(E) I and III only

21. The sum of the odd numbers less than 4 and the even numbers less than 9 is

(A) 11
(B) 13
(C) 24
(D) 42
(E) 45

22. If you multiply a number less than 1000 by one less than a hundred, then the greatest possible answer you could get is

(A) 98,901
(B) 100,000
(C) 1,000,000
(D) 998,901
(E) 99,999

23. If $\begin{array}{r} A \\ -B \\ \hline C \end{array}$, then which of the following is (are) true?

I $\begin{array}{r} A \\ +C \\ \hline B \end{array}$

II $\begin{array}{r} A \\ -C \\ \hline B \end{array}$

III $\begin{array}{r} B \\ +C \\ \hline A \end{array}$

(A) I only
(B) III only
(C) I and II
(D) I and III
(E) II and III

24. How many pieces of wood will you have if you cut across a long board 17 times with a saw?

(A) 16
(B) 17
(C) 18
(D) 19
(E) None of these

25. A chess club ran a weekly tournament in which every member played every other member just once. When <u>one more</u> member was admitted, it was found necessary to play <u>eight more</u> games per tournament. Now how many members are there in the club?

(A) 20
(B) 16
(C) 12
(D) 9
(E) 8

STOP. If you finish before time is called, check your work on this part. Do not go back to any previous part. Do not turn this page until you are asked to do so.

Instructions

Part IV

Arithmetic Reasoning

This section consists of problems in arithmetic. However, you do not have to find the answer to each problem. You only have to tell how the answer could be found.

Example O.

Jane's father was 26 years old when she was born. Jane is now 8 years old. How old is her father now?

(A) subtract

(B) divide

(C) add

(D) multiply

Jane's father is now 34 years old. But, you are not asked to find this. You are asked how to find this. Since his age is found by adding 26 and 8, choice (C) should be circled.

Example OO.

Desks are priced at $40 each. If bought in lots of 4, the total price is reduced by $20. How much would 4 desks cost?

(A) divide and add

(B) multiply and multiply

(C) subtract and divide

(D) multiply and subtract

One way to solve the problem would be to multiply $40 by 4 and then subtract 20 from the product. So choice (D) should be circled.

Although some problems may be worked in more than one way, only one of the ways will be given among the answer choices.

You should only guess if you can rule out some of the choices. DO NOT guess wildly.

Mark your answers on the same answer sheet, starting with number 26.

You will have 5 minutes for this section. There are 3 pages in this section. If you finish before time is called, check your work.

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

26. Joe wants to buy a football costing $5.25. He has saved $4.50. How much more money does he need to save?

(A) subtract
(B) add
(C) divide
(D) multiply

27. Five boys share three melons equally. What was each boy's share?

(A) add
(B) divide
(C) subtract
(D) multiply

28. A ham weighing $16\frac{3}{4}$ pounds was cut into two pieces. If one piece weighed $9\frac{1}{3}$ pounds, what was the weight of the other piece?

(A) subtract
(B) divide
(C) multiply
(D) add

29. A man wants to seed a lawn around his new home. His lot is 120 feet by 90 feet (10,800 sq. feet). His house is centered on the lot and occupies 2,785 square feet. How many square feet of ground may be put into lawn?

(A) add
(B) divide
(C) multiply
(D) subtract

30. A wholesale meat dealer sells sirloin steak for $.72 per pound and chuck steak for $.31 per pound. One day he sold 79 pounds of each. How much money was taken in?

(A) add and divide
(B) add and multiply
(C) multiply and subtract
(D) divide and divide

GO ON TO THE NEXT PAGE

31. A cyclist in an international bicycle race has covered an average of 9 miles every 20 minutes. If he can maintain the same average speed, how long will it take him to cycle the remaining 84 miles of the race?

(A) divide and multiply
(B) subtract and divide
(C) add and subtract
(D) divide and add

32. A grocer sells oranges for 59 cents a dozen. The oranges cost him 33 cents a dozen. How much profit is there on each orange?

(A) subtract and multiply
(B) divide and subtract
(C) add and divide
(D) subtract and divide

33. A boy works in a store after school for a total of 10 hours a week. He also works 8 hours on Saturdays. How much is he being paid per hour, if he makes $20.70 per week?

(A) multiply and subtract
(B) add and divide
(C) divide and subtract
(D) add and multiply

34. A certain cut of beef costs $.75 per pound. How much beef could a housewife serve to each of 5 people, if she could only afford to spend $2.00 for the beef?

(A) divide and divide
(B) multiply and add
(C) subtract and multiply
(D) divide and multiply

GO ON TO THE NEXT PAGE

35. At the beginning of a month, a car rental organization rented 37 cars. During the month, 32 of these cars were returned. If, at the end of the month, 43 of their cars were being rented, how many new rentals had been made?

(A) subtract and divide
(B) subtract and subtract
(C) add and divide
(D) multiply and add

STOP. If you finish before time is called, check your work.

1. WRITE YOUR NAME IN THIS SPACE. _____

2. DO NOT OPEN THIS BOOKLET UNTIL INSTRUCTED TO DO SO.

Starting Time: _____

Finishing Time: _____

MISSING WORDS

The problems in this booklet were copied from some mathematics textbooks. When they were copied, some of the words were left out.

There is a line under each space where a word has been left out. Each space represents a missing word, but the length of the space does not correspond to the length of the missing word. Some are short and others are longer. Misspelled words will not be counted wrong.

Fill in each space with the correct word. In finding each word make sure it fits the sentence and paragraph.

DO NOT DO THE PROBLEMS. Just try to fill in the missing words. The first word has been filled in for you.

Record your starting time and finishing time at the top right hand corner of this booklet.

SCHOOL MATHEMATICS STUDY GROUP

FORM EA

1. Ed's parents took him to visit a park. _____ drove 269 miles the _____ day. The second day _____ went 317 miles. How far _____ they travel in 2 days?

2. The Moosehead Lake _____ Maine has an area of 116.98 _____ miles. The area of Lake Mead _____ Nevada is 228.83 square miles. Which _____ has the greater area? _____ much greater?

3. Ed _____ 14 different car license plates. _____ next day he saw 9. _____ claims he saw 24 in 2 _____ . Did he? How do _____ know?

4. The 21 children on _____ playground decided to play _____ team game. It took 6 _____ for each team. How _____ teams could they make _____ the 21 children?

5. The Jones _____ and their neighbors, the Smith _____, are going on vacations. _____ two families will travel _____ opposite directions. If the Jones _____ averages 55 miles per hour _____ the Smith family 45 miles _____ hour, when will they _____ 750 miles apart if they start at the same time?

6. The 14 Brownies _____ Mrs. Lake's group invited the 18 _____ of Mrs. Webster's group to go _____ a picnic with them. _____ many Brownies would be _____ to the picnic if everyone could go?

7. Betty _____ Jim are at the zoo. _____ zoo keeper wanted to _____ a baby gorilla, but _____ baby gorilla would not stay on the scale. The _____ keeper solved the problem _____ weighing the mother gorilla _____. She weighed 162 pounds. Then _____ weighed the mother gorilla holding the baby gorilla in _____ arms. Together they weighed 190 _____. Then the zoo keeper could _____ out the baby gorilla's _____.

8. Because of his way of life, early _____ needed only whole numbers. _____ can think of reasons _____ he came to need other numbers as time went _____. For example, he might _____ wanted to trade more _____ 2 but less than 3 hides _____ a weapon. He might _____ wished to tell someone _____ there was some food _____ not enough for a _____. He could not have _____ these situations with whole _____ alone. Today you would __ _____ great difficulty in making _____ understood if you could _____ only whole numbers. Suppose _____ knew only whole numbers. _____ you describe any of _____ with a whole number?

(a) _____ trip that took less _____ one day.

(b) The amount _____ candy you get when _____ share a candy bar _____ two friends.

(c) The number _____ books you read this summer, if you read more _____ 8 and less than 9.

You _____ have even more difficulty _____ mathematics if you could _____ only whole numbers. There _____ be no result for such operations as $2 \div 5$ or $8 \div 3$. Another _____ of numbers helps you _____ answers to such operations. _____ set of numbers is _____ the set of rational numbers.

SECOND MATHEMATICS INVENTORY

FORM B5

This is an inventory of some of the mathematics understandings and skills you may have studied since school started last September. It is not a test. Your score will not count in your grade. This inventory will help us to evaluate the tests you took last fall.

Part I of this inventory consists of some division problems. Use the blank spaces for scratch work. Write your answers on the Answer Sheet. Here are two examples.

EXAMPLE O

$7\overline{)21}$

ANSWER

O. 3

EXAMPLE OO

$6\overline{)13}$

ANSWER

OO. 2 R1

Note how the remainder is written in Example OO.

You will have 10 minutes for this part.

DO NOT TURN PAGE UNTIL ASKED TO DO SO.

PART I

1. $18\sqrt{109}$

2. $40\sqrt{280}$

3. $24\sqrt{482}$

4. $87\sqrt{350}$

5. $21\sqrt{82}$

6. $500\sqrt{3029}$

In Part II of this inventory, each question or problem is followed by five or less answer choices. Decide which one you think is best. Record your answer on the Answer Sheet by circling the letter of the answer you choose. Be sure to mark only one answer for each question. If you wish to change an answer, be sure to erase your first choice completely.

Note how the answer to the sample question has been marked on the sample answer sheet below:

SAMPLE QUESTION:

USE THIS SPACE FOR SCRATCHWORK

0. 2 + 2 is

(A) 1 (D) 4

(B) 2 (E) 5

(C) 3

The correct answer is 4, which is choice (D). Therefore, (D) has been circled.

0. (A) 1 (B) 2 (C) 3 ((D)) 4 (E) 5

There may be some problems you have not yet learned to do. First try all of the problems you can. Then, if you have time, go back and try the questions you did not answer.

You will have 25 minutes for this part.

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

PART II

7. How many different straight lines pass through one point?

(A) 1 only
(B) 2 only
(C) 3 only
(D) 6 only
(E) more than can be counted

8. What number does ◇ stand for if $3 \times 4 \times 5 = 12 \times$ ◇ is a true statement?

(A) 20
(B) 0
(C) 3
(D) 4
(E) 5

9. If a new system of number notation used the following symbols:

△ stands for zero □ stands for five

◇ stands for eight ○ stands for two

Which is the correct answer to the example?

□ △ ○
− ○ ◇ △
_____

(A) □ ◇ ○
(B) ○ △ ○
(C) ◇ ○ ○
(D) ○ ○ ◇
(E) ○ ○ ○

For each of the next two problems, state whether the expression is a correct way of rewriting 5308.

10. $4000 + 1300 + 8$

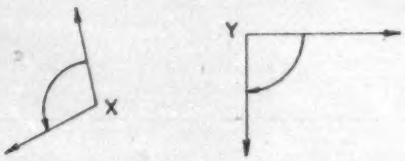
(A) YES (B) NO

11. $(5 \times 1000) + (3 \times 100) + (8 \times 10)$

(A) YES (B) NO

12. For what number n does $43 \times 79 = (43 \times 70) + (43 \times n)$?

(A) 43
(B) 79
(C) 9
(D) 3397
(E) 387



13. (A) Angle Y is smaller than angle X.
(B) Angle Y is the same size as angle X.
(C) Angle Y is larger than angle X.

14.

$$\begin{array}{r} 82 \\ 23 \\ \hline 18 \\ 72 \\ 4 \\ 16 \\ \hline 2378 \end{array}$$

In the problem above 4 is placed where it is to stand for

(A) $20 \times 2 = 40$
(B) $8 \times 5 = 40$
(C) $2 + 2 = 4$
(D) $10 \times 4 = 40$
(E) 4 ones

15. Without making any calculations, choose the answer choice which is the best estimate of the answer to this question.

When the Smith family left on their vacation, the speedometer read 19,628.6 miles. When they returned, it read 22,405.3. How many miles had the Smiths traveled?

(A) 300 miles
(B) 3,000 miles
(C) 13,000 miles
(D) 30,000 miles
(E) 40,000 miles

Questions 16 - 17 refer to the following problem:

Step 1

$$53\overline{)1273}\quad \begin{array}{r}2\\ 106\end{array}$$

Step 2

$$53\overline{)1273}\quad \begin{array}{r}2\\ 106\\ \hline 213\end{array}$$

Step 3

$$53\overline{)1273}\quad \begin{array}{r}24\\ 106\\ \hline 213\\ 212\\ \hline 1\end{array}$$

16. In Step 2, 213 is placed where it is to stand for

(A) 1273 - 1060
(B) 2×53
(C) 127 - 106
(D) 4×50
(E) 73 - 60

17. In Step 3, 212 is placed where it is to stand for

(A) 24×53
(B) $1273 \div 53$
(C) the remainder
(D) 4×53
(E) a factor of 1273

18. What number can you use for both frames to make this sentence FALSE?

$2 \times 7 \times \Diamond = \Diamond \times 14$

(A) 0
(B) 1
(C) 14
(D) no number
(E) every number

19. How many points has a straight line?

(A) 4 only
(B) 5 only
(C) 9 only
(D) 17 only
(E) more than can be counted

In each of the next four problems, decide which number should go in the box to make the sentence true.

20. $39 \div 3 = \square \times 39$

(A) $\frac{1}{10}$
(B) $\frac{1}{3}$
(C) $\frac{1}{2}$
(D) 1
(E) None of these

21. $(12 + \square) + 8 = 12 + (2 + 8)$

(A) 2
(B) 4
(C) 8
(D) 12
(E) None of these

22. $37 + 53 = \square + 37$

(A) 37
(B) 90
(C) 16
(D) 53
(E) None of these

23. $7 \times \square = (7 \times 30) + (7 \times 4)$

(A) 3
(B) 4
(C) 30
(D) 34
(E) None of these

24. Without making any calculations, choose the answer choice which is the best <u>estimate</u> of the answer to this problem.

If there are 5,280 feet in one mile, how many feet are there in 7 miles?

(A) 35
(B) 350
(C) 3,500
(D) 35,000
(E) 350,000

How would you find the number to go in the box in each of these next two problems?

25. $\square \times 36 = 252$

(A) add (C) multiply
(B) subtract (D) divide

26. $\square \div \frac{54}{13} = 8$

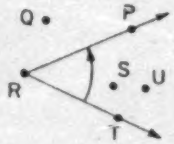
(A) add (C) multiply
(B) subtract (D) divide

27. Which of the following will always produce an odd number?

I. The sum of any two odd numbers.
II. The sum of any three even numbers.
III. The sum of any three odd numbers.

(A) I only
(B) II only
(C) III only
(D) I and II only
(E) I and III only

Questions 28 - 29 refer to the folling figure:



28. Which of the points are in the interior of angle PRT?

(A) Q only

(B) S only

(C) T only

(D) S and U only

(E) P, S, T, and U

29. Which of the points are in the exterior of angle PRT?

(A) Q only

(B) S only

(C) T only

(D) S and U only

(E) P, S, U, and T

In finding the answer to 37×52 the steps could be written as

$$\begin{array}{ll} & 37 \\ & \times\ 52 \\ \hline \text{Step 1} & 74 \\ \text{Step 2} & 185 \\ \hline \text{Step 3} & 1924 \end{array}$$

30. In Step 1, 74 is placed where it is to stand for

(A) $(7 \times 100) + (4 \times 10)$

(B) $7 + 4$

(C) $2 \times (30 + 7)$

(D) 7×4

(E) 5×37